

09/49347

ABSTRACT

A method for fabricating ion exchange waveguides, such as lithium niobate or lithium tantalate waveguides in optical modulators and other optical waveguide devices, utilizes pressurized annealing to further diffuse and limit exchange of the ions and includes ion exchanging the crystalline substrate with a source of ions and annealing the substrate by pressurizing a gas atmosphere containing the lithium niobate or lithium tantalate substrate above normal atmospheric pressure, heating the substrate to a temperature ranging from about 150 degrees Celsius to about 1000 degrees Celsius, maintaining pressure and temperature to effect greater ion diffusion and limit exchange, and cooling the structure to an ambient temperature at an appropriate ramp down rate. In another aspect of the invention a powder of the same chemical composition as the crystalline substrate is introduced into the anneal process chamber to limit the crystalline substrate from outgassing alkaline earth metal oxide during the anneal period. In yet another aspect of the invention an anneal container is provided that allows for crystalline substrates to be annealed in the presence of powder without contaminating the substrate with the powder during the anneal process. Waveguides manufactured in accordance with the method exhibit superior drift performance.